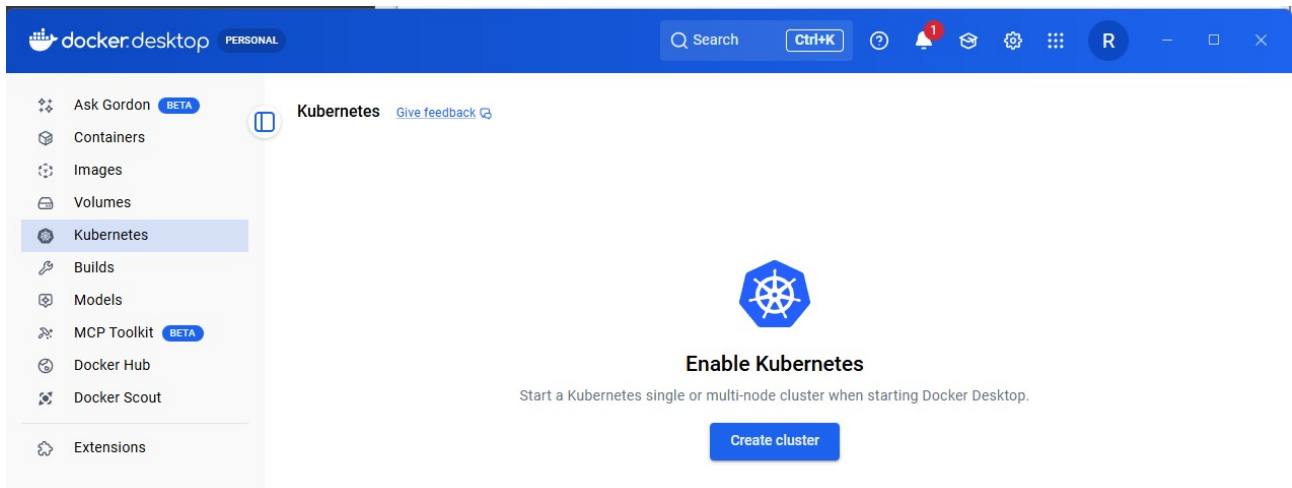


Chapitre 5 – Kubernetes : plateforme de déploiement des applications conteneurisées

- 1. Kubernetes avec Docker Desktop..... 1
- 2. Installation de Minikube..... 6
- 3. Le tableau de bord de Kubernetes..... 14
- 4. Créer un déploiement à l'aide de l'outil kubectl..... 19
- 5. Automatisation de déploiement par fichier YAML..... 26

1. Kubernetes avec Docker Desktop.



Create Kubernetes Cluster

Cluster Type

Kubeadm
Create a single-node cluster with kubeadm.
Version: v1.34.1

kind
Create a cluster containing one or more nodes with kind. Requires the [containerd image store](#)

Advanced Settings

Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.

Create Kubernetes Cluster



Cluster Type

Kubeadm
Create a single-node cluster with kubeadm.
Version: v1.34.1

kind
Create a cluster containing one or more nodes with kind. Requires the [containerd image store](#)

Node(s): 2

Changing the number of nodes resets the cluster. All stacks and resources are deleted.



Version: 1.34.3

Changing the Kubernetes version resets your cluster. All stacks and resources are deleted.

Kubernetes version

Advanced Settings

Show system containers (advanced)

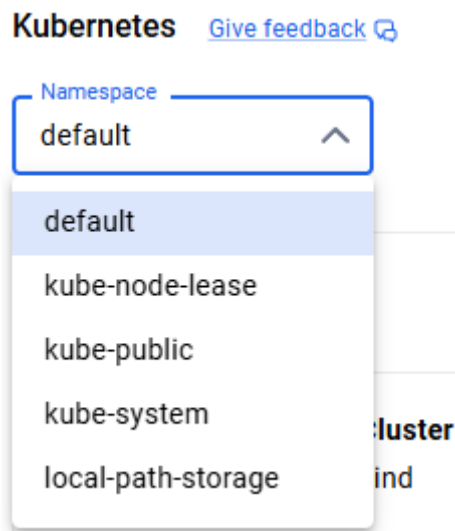
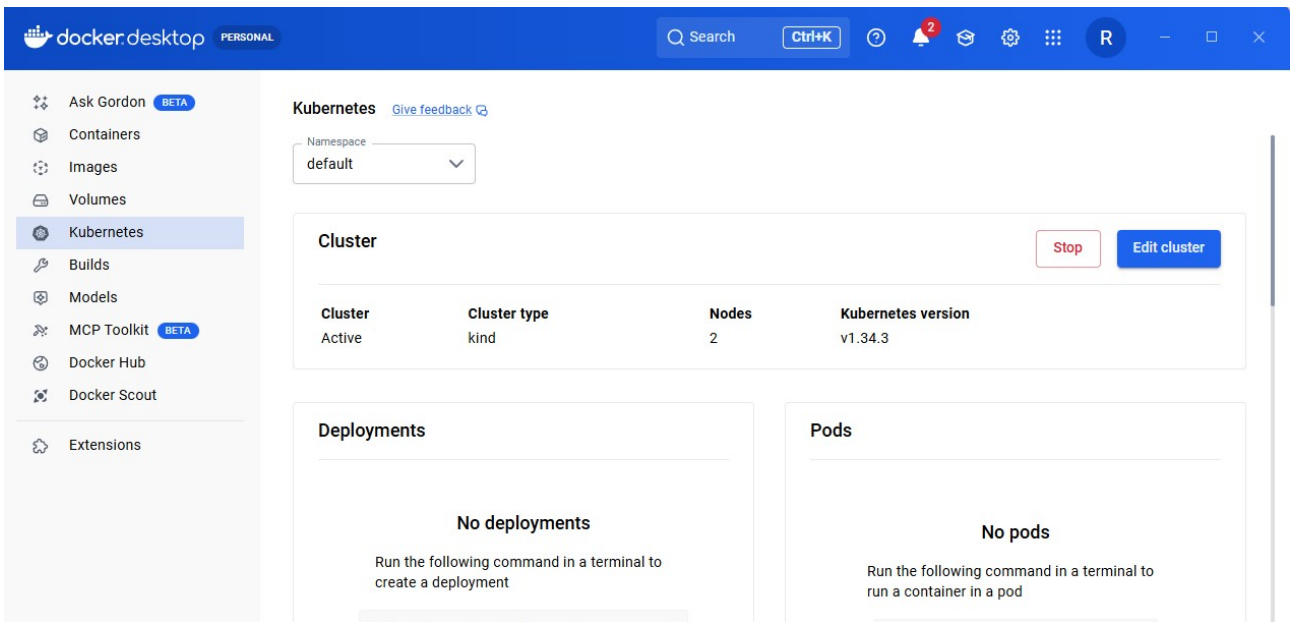
Show Kubernetes internal containers when using Docker commands.

Kubernetes Cluster Installation

Installation takes a few minutes and requires an internet connection.

Cancel

Install



2 nœuds : un maître et un worker

```
Windows PowerShell
Copyright (C) Microsoft Corporation. Tous droits réservés.

Installez la dernière version de PowerShell pour de nouvelles fonctionnalités
s

PS C:\WINDOWS\system32> kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
desktop-control-plane Ready    control-plane  2m3s  v1.34.3
desktop-worker      Ready    <none>     108s  v1.34.3
PS C:\WINDOWS\system32> |
```

Modify Kubernetes Cluster



Cluster Type

Kubeadm
Create a single-node cluster with kubeadm.
Version: v1.34.1

kind
Create a cluster containing one or more nodes with kind. Requires the [containerd image store](#)

Node(s): 3

Changing the number of nodes resets the cluster. All stacks and resources are deleted.



Version: 1.34.3

Changing the Kubernetes version resets your cluster. All stacks and resources are deleted.

Kubernetes version
1.34.3

Advanced Settings

Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.

Change Kubernetes cluster configuration?

Changing the number of nodes deletes the current cluster and creates a new one.

Cancel

Yes

docker.desktop PERSONAL

Search Ctrl+K

- Ask Gordon BETA
- Containers
- Images
- Volumes
- Kubernetes**
- Builds
- Models
- MCP Toolkit BETA
- Docker Hub
- Docker Scout
- Extensions

Kubernetes [Give feedback](#)

Namespace: default

Cluster Stop Edit cluster

Cluster	Cluster type	Nodes	Kubernetes version
Active	kind	3	v1.34.3

Deployments

No deployments

Run the following command in a terminal to create a deployment

```
kubect1 create deployment my-app --i
mage=nginx
```

Pods

No pods

Run the following command in a terminal to run a container in a pod

```
kubect1 run nginx --image nginx
```

```
Windows PowerShell
PS C:\WINDOWS\system32> kubect1 get nodes
NAME                STATUS    ROLES    AGE   VERSION
desktop-control-plane Ready    control-plane 99s   v1.34.3
desktop-worker       Ready    <none>    82s   v1.34.3
desktop-worker2      Ready    <none>    83s   v1.34.3
PS C:\WINDOWS\system32> |
```

docker.desktop PERSONAL

Search Ctrl+K

- Ask Gordon BETA
- Containers**
- Images
- Volumes
- Kubernetes
- Builds
- Models
- MCP Toolkit BETA
- Docker Hub
- Docker Scout
- Extensions

Containers [Give feedback](#)

Container CPU usage: 16.11% / 1600% (16 CPUs available)

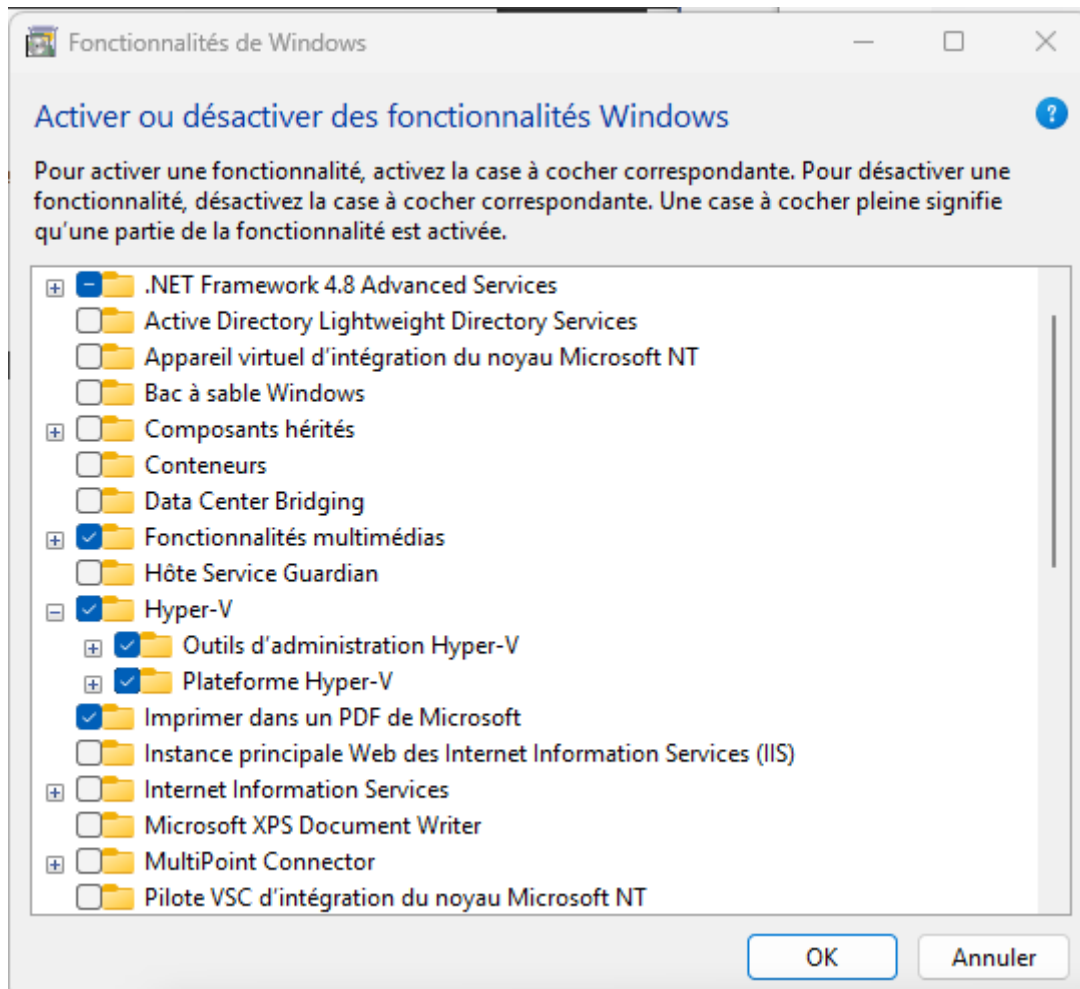
Container memory usage: 1.29GB / 14.95GB Show charts

Search ☰ Only show running containers

<input type="checkbox"/>	<input type="checkbox"/>	Name	Container ID	Image	Port(s)	CPU (%)	Mem	Actions
<input type="checkbox"/>	<input checked="" type="checkbox"/>	desktop-worker	1ff72071811b	kindest/no		2.99%	129.	🔍 🔵 ⋮ 🗑️
<input type="checkbox"/>	<input checked="" type="checkbox"/>	desktop-control	4ec6a39f5085	kindest/no	51168:6443	9.21%	556.	🔍 🔵 ⋮ 🗑️
<input type="checkbox"/>	<input checked="" type="checkbox"/>	desktop-worker	0581837ec2e0	kindest/no		3.6%	129.	🔍 🔵 ⋮ 🗑️
<input type="checkbox"/>	<input checked="" type="checkbox"/>	kind-registry-mi	8d93f76a32c1	docker/des		0%	3.71	🔍 🔵 ⋮ 🗑️
<input type="checkbox"/>	<input checked="" type="checkbox"/>	kind-cloud-prov	735e9a72ff04	docker/des		0%	10.6	🔍 🔵 ⋮ 🗑️

2. Installation de Minikube.

1) Activer la fonctionnalité Windows Hyper-V :



2) Installer Minikube

minikube start

minikube is local Kubernetes, focusing on making it easy to learn and develop for Kubernetes.

All you need is Docker (or similarly compatible) container or a Virtual Machine environment, and Kubernetes is a single command away: `minikube start`

What you'll need

- 2 CPUs or more
- 2GB of free memory
- 20GB of free disk space
- Internet connection
- Container or virtual machine manager, such as: [Docker](#), [QEMU](#), [Hyperkit](#), [Hyper-V](#), [KVM](#), [Parallels](#), [Podman](#), [VirtualBox](#), or [VMware Fusion/Workstation](#)

1 Installation

Click on the buttons that describe your target platform. For other architectures, see [the release page](#) for a complete list of minikube binaries.

Operating system:

Architecture:

Release type:

Installer type:

To install the latest minikube **stable** release on **x86-64 Windows** using **.exe download**:

1. Download and run the installer for the [latest release](#).

Or if using PowerShell, use this command:

```
New-Item -Path 'c:\' -Name 'minikube' -ItemType Directory -Force
$ProgressPreference = 'SilentlyContinue'; Invoke-WebRequest -OutFile 'c:\minikube\minikube.exe
```

2. Add the minikube.exe binary to your PATH.

Make sure to run PowerShell as Administrator.

```
$oldPath = [Environment]::GetEnvironmentVariable('Path', [EnvironmentVariableTarget]::Machine)
if ($oldPath.Split(';') -notincontains 'C:\minikube'){
    [Environment]::SetEnvironmentVariable('Path', $('{0};C:\minikube' -f $oldPath), [Environment]
}
```

If you used a terminal (like powershell) for the installation, please close the terminal and reopen it before running minikube.

```
Administrateur : Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. Tous droits réservés.

Installez la dernière version de PowerShell pour de nouvelles fonctionnalités et améliorations ! https://aka.ms/PSWindows
PS C:\WINDOWS\system32> New-Item -Path 'c:\' -Name 'minikube' -ItemType Directory -Force

Répertoire : C:\

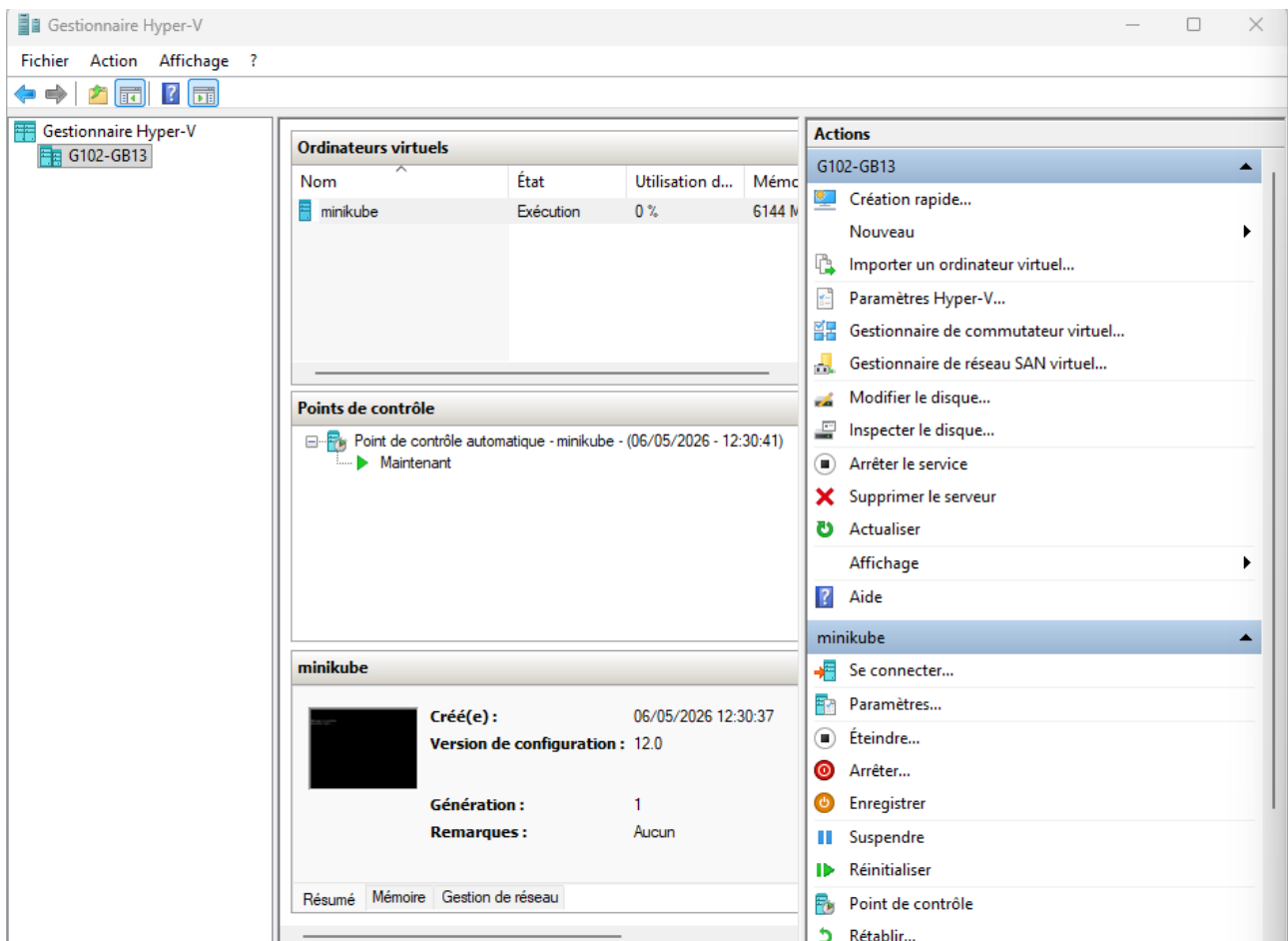
Mode                LastWriteTime         Length Name
----                -
d-----          29/04/2026   15:34             minikube

PS C:\WINDOWS\system32> $ProgressPreference = 'SilentlyContinue'; Invoke-WebRequest -OutFile 'c:\minikube\minikube.exe'
-Uri 'https://github.com/kubernetes/minikube/releases/latest/download/minikube-windows-amd64.exe' -UseBasicParsing
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> $oldPath = [Environment]::GetEnvironmentVariable('Path', [EnvironmentVariableTarget]::Machine)
PS C:\WINDOWS\system32> if ($oldPath.Split(';')-notincontains 'C:\minikube'){
>> [Environment]::SetEnvironmentVariable('Path', $('{};C:\minikube' -f $oldPath), [EnvironmentVariableTarget]::Machine)
>> }
PS C:\WINDOWS\system32>
```

```
PS C:\WINDOWS\system32> minikube start --driver=hyperv
* minikube v1.38.1 sur Microsoft Windows 11 Pro Education 25H2
* Utilisation du pilote hyperv basé sur la configuration de l'utilisateur
! Starting v1.39.0, minikube will default to "containerd" container runtime. See #21973 for more info.
* Téléchargement de l'image de démarrage de la VM...
  > minikube-v1.38.0-amd64.iso...: 65 B / 65 B [-----] 100.00% ? p/s 0s
  > minikube-v1.38.0-amd64.iso: 370.55 MiB / 370.55 MiB 100.00% 1.22 MiB p/
* Démarrage du nœud "minikube" primary control-plane dans le cluster "minikube"
* Création de VM hyperv (CPUs=2, Mémoire=6144MB, Disque=20000MB)...
* Préparation de Kubernetes v1.35.1 sur Docker 28.5.2...
* Configuration de bridge CNI (Container Networking Interface)...
* Vérification des composants Kubernetes...
  - Utilisation de l'image gcr.io/k8s-minikube/storage-provisioner:v5
* Modules activés: storage-provisioner, default-storageclass
* Terminé ! kubectl est maintenant configuré pour utiliser "minikube" cluster et espace de noms "default" par défaut.
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get nodes
NAME          STATUS    ROLES    AGE   VERSION
minikube     Ready    control-plane   89s   v1.35.1
PS C:\WINDOWS\system32>
```



Commande pour lister les objets :

```

Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get all
NAME                                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes                  ClusterIP     10.96.0.1    <none>        443/TCP    2m35s
PS C:\WINDOWS\system32>

```

Mon premier objet (type pod) : créer un pod nginx via kubectl :

```

Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl run monpod --image=nginx:latest
pod/monpod created
PS C:\WINDOWS\system32>

```

```

Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get pods
NAME    READY   STATUS    RESTARTS   AGE
monpod  1/1     Running   0           35s
PS C:\WINDOWS\system32>

```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get all
NAME                READY   STATUS    RESTARTS   AGE
pod/monpod          1/1     Running   0           62s

NAME                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP     10.96.0.1    <none>        443/TCP    4m42s
PS C:\WINDOWS\system32>
```

Consulter le log d'un pod :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl logs pod/monpod
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2026/05/06 10:35:16 [notice] 1#1: using the "epoll" event method
2026/05/06 10:35:16 [notice] 1#1: nginx/1.29.8
2026/05/06 10:35:16 [notice] 1#1: built by gcc 14.2.0 (Debian 14.2.0-19)
2026/05/06 10:35:16 [notice] 1#1: OS: Linux 6.6.95
2026/05/06 10:35:16 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2026/05/06 10:35:16 [notice] 1#1: start worker processes
2026/05/06 10:35:16 [notice] 1#1: start worker process 29
2026/05/06 10:35:16 [notice] 1#1: start worker process 30
PS C:\WINDOWS\system32>
```

Les espaces de noms dans lesquels sont créés les objets :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get namespace
NAME                STATUS    AGE
default             Active    5m59s
kube-node-lease     Active    5m59s
kube-public         Active    5m59s
kube-system         Active    5m59s
PS C:\WINDOWS\system32>
```

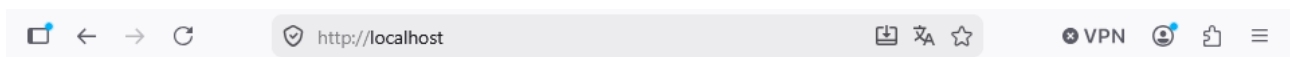
Les objets : singulier ou pluriel, peu importe

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get pods
NAME    READY   STATUS    RESTARTS   AGE
monpod  1/1     Running   0           2m45s
PS C:\WINDOWS\system32> kubectl get pod
NAME    READY   STATUS    RESTARTS   AGE
monpod  1/1     Running   0           2m47s
PS C:\WINDOWS\system32>
```



```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl describe pod/monpod
Name:          monpod
Namespace:     default
Priority:       0
Service Account: default
Node:          minikube/172.25.34.187
Start Time:    Wed, 06 May 2026 12:35:01 +0200
Labels:        run=monpod
Annotations:   <none>
Status:        Running
IP:            10.244.0.3
IPs:
  IP: 10.244.0.3
Containers:
  monpod:
    Container ID:  docker://f6b98a2899f1be10d2b0d02adbe55ad98c12e50fc56dadf4b40d899da7627708
    Image:          nginx:latest
    Image ID:       docker-pullable://nginx@sha256:6e23479198b998e5e25921dff8455837c7636a67111a04a635cf1bb363d199dc
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Wed, 06 May 2026 12:35:16 +0200
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-rq9r9 (ro)
Conditions:
  Type                 Status
  PodReadyToStartContainers  True
```

```
PS C:\WINDOWS\system32> kubectl port-forward monpod 80
Forwarding from 127.0.0.1:80 -> 80
Forwarding from [::1]:80 -> 80
Handling connection for 80
```



Welcome to nginx!

If you see this page, nginx is successfully installed and working. Further configuration is required for the web server, reverse proxy, API gateway, load balancer, content cache, or other features.

For online documentation and support please refer to nginx.org.
To engage with the community please visit community.nginx.org.
For enterprise grade support, professional services, additional security features and capabilities please refer to f5.com/nginx.

Thank you for using nginx.

Détruire le pod nginx :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl delete pod/monpod
pod "monpod" deleted from default namespace
PS C:\WINDOWS\system32> kubectl get pod
No resources found in default namespace.
PS C:\WINDOWS\system32>
```

3. Le tableau de bord de Kubernetes.

Activer le plugin :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> minikube addons enable dashboard
* dashboard est un addon maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
- Utilisation de l'image docker.io/kubernetesui/dashboard:v2.7.0
- Utilisation de l'image docker.io/kubernetesui/metrics-scraper:v1.0.8
* Certaines fonctionnalités du tableau de bord nécessitent le module complémentaire metrics-server. Pour activer toutes les fonctionnalités, veuillez exécuter :

    minikube addons enable metrics-server

* Le module 'dashboard' est activé
PS C:\WINDOWS\system32>
```

Comme indiqué ci-dessus, activer le serveur de métriques pour bénéficier de l'ensemble des fonctionnalités du tableau de bord :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> minikube addons enable metrics-server
* metrics-server est un addon maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
- Utilisation de l'image registry.k8s.io/metrics-server/metrics-server:v0.8.1
* Le module 'metrics-server' est activé
PS C:\WINDOWS\system32>
```

Accès au tableau de bord :

Créer en ligne Créer depuis un fichier Créer depuis un formulaire

Nom de l'application *
mailpit 7 / 24

Image du conteneur *
axllent/mailpit

Nombre de pods *
1

Service *
None

Espace de nom *
default

[Déployer](#) [Preview](#) [Annuler](#) [Afficher les options avancées](#)

Nom	Images	Étiquettes	Pods	Date de création ↑
mailpit	axllent/mailpit	k8s-app: mailpit	1 / 1	47.seconds ago

Nom	Images	Étiquettes	Noeud	Statut	Redémarrag	Utilisation CPU (coeurs)	Utilisation mémoire (octets)	Date de création
mailpit-5d8c9cd4-78qjn	axlent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	minikube	Running	0	1,00m	6,85Mi	8 minutes ago

Workloads

- Cron Jobs
- Daemon Sets
- Deployments**
- Jobs
- Pods
- Replica Sets
- Replication Controllers
- Stateful Sets

Service

- Ingresses
- Ingress Classes

CPU Usage

Memory Usage

Déploiements

Nom	Images	Étiquettes	Pods	Date de création
mailpit	axlent/mailpit	k8s-app: mailpit	1 / 1	7 minutes ago

Workloads

- Cron Jobs
- Daemon Sets
- Deployments**
- Jobs
- Pods
- Replica Sets
- Replication Controllers
- Stateful Sets

Service

- Ingresses
- Ingress Classes
- Services

Config and Storage

- Config Maps

1 1 1

Conditions

Type	Statut	Dernière sonde
Available	True	8 minutes ago
Progressing	True	8 minutes ago

Nouveau Replica Set

Nom	Espace de nom	Âge	Pods
mailpit-5d8c9cd4	default	8 minutes ago	1 / 1

Étiquettes: k8s-app: mailpit, pod-template-hash: 5d8c9cd4

Images: axlent/mailpit

Workloads

- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods
- Replica Sets**
- Replication Controllers
- Stateful Sets

Service

- Ingresses
- Ingress Classes
- Services

Config and Storage

- Config Maps
- Persistent Volume Claims
- Secrets
- Storage Classes

Cluster

- Cluster Role Bindings
- Cluster Roles
- Events
- Namespaces

Métadonnées

Nom: mailpit-5d8c9cd4 Espace de nom: default Date de création: 6 mai 2026 Âge: 8 minutes ago UID: a61510fc-6fcb-46f9-bc62-f65c653dc540

Étiquettes: k8s-app: mailpit, pod-template-hash: 5d8c9cd4

Annotations: deployment.kubernetes.io/desired-replicas: 1, deployment.kubernetes.io/max-replicas: 2, deployment.kubernetes.io/revision: 1

Informations sur la ressource

Sélecteur: k8s-app: mailpit, pod-template-hash: 5d8c9cd4 Images: axlent/mailpit

Statut des pods

En fonctionnement	Désirés
1	1

Pods

Nom	Images	Étiquettes	Noeud	Statut	Redémarrag	Utilisation CPU (coeurs)	Utilisation mémoire (octets)	Date de création
mailpit-5d8c9cd4-78qjn	axlent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	minikube	Running	0	1,00m	7,09Mi	8 minutes ago

Charges de travail > Replica Sets > mailpit-5d8c9cd4

Workloads N

- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods
- Replica Sets**
- Replication Controllers
- Stateful Sets

Service

- Ingresses N
- Ingress Classes
- Services N

Config and Storage

- Config Maps N
- Persistent Volume Claims N
- Secrets N
- Storage Classes

Métadonnées

Nom	Espace de nom	Date de création	Âge	UID
mailpit-5d8c9cd4	default	6 mai 2026	10 minutes ago	a61510fc-6fcb-46f9-bc62-f65c653dc540

Étiquettes

- k8s-app: mailpit
- pod-template-hash: 5d8c9cd4

Annotations

- deployment.kubernetes.io/desired-replicas: 2
- deployment.kubernetes.io/max-replicas: 3
- deployment.kubernetes.io/revision: 1

Informations sur la ressource

Sélecteur

- k8s-app: mailpit
- pod-template-hash: 5d8c9cd4

Images

- axllent/mailpit

Statut des pods

En fonctionnement	Désirés
2	2

Mise à jour :

Charges de travail > Déploiements > mailpit

Workloads N

- Cron Jobs
- Daemon Sets
- Deployments**
- Jobs
- Pods
- Replica Sets
- Replication Controllers

Métadonnées

Nom	Espace de nom	Date de création	Âge	UID
mailpit	default	6 mai 2026	10 minutes ago	39f606d2-82a8-4bb4-806d-a409dc61fada

Étiquettes

- k8s-app: mailpit

Annotations

- deployment.kubernetes.io/revision: 1

Éditer une ressource


YAML	JSON
1	kind: Deployment
2	apiVersion: apps/v1
3	metadata:
4	name: mailpit
5	namespace: default
6	uid: 39f606d2-82a8-4bb4-806d-a409dc61fada
7	resourceVersion: '3608'
8	generation: 2
9	creationTimestamp: '2026-05-06T11:24:31Z'
10	labels:
11	k8s-app: mailpit
12	annotations:
13	deployment.kubernetes.io/revision: '1'
14	managedFields:
15	- manager: dashboard
16	operation: Update
17	apiVersion: apps/v1
18	fieldsType: FieldsV1
19	fieldsV1:
20	f:spec:
21	f:replicas: {}

 Cette action est équivalente à : `kubectl apply -f <spec.yaml>`

[Mettre à jour](#) [Annuler](#)

Éditer une ressource

YAML	JSON
103	spec:
104	replicas: 2
105	selector:
106	matchLabels:
107	k8s-app: mailpit
108	template:
109	metadata:
110	name: mailpit
111	labels:
112	k8s-app: mailpit
113	spec:
114	containers:
115	- name: mailpit
116	image: axllent/mailpit:latest
117	resources: {}
118	terminationMessagePath: /dev/termination-log
119	terminationMessagePolicy: File
120	imagePullPolicy: Always
121	securityContext:
122	privileged: false
123	restartPolicy: Always
124	terminationGracePeriodSeconds: 30

 Cette action est équivalente à : `kubectl apply -f <spec.yaml>`

[Mettre à jour](#) [Annuler](#)

Kubernetes va créer un nouveau ReplicaSet :

The screenshot shows the 'Replica Sets' page in the Kubernetes dashboard. It features a table with columns for Name, Images, Labels, Pods, and Date de création. Two Replica Sets are listed:

Nom	Images	Étiquettes	Pods	Date de création
mailpit-6f94d7dc8f	axllent/mailpit:latest	k8s-app: mailpit pod-template-hash: 6f94d7dc8f	2 / 2	15 seconds ago
mailpit-5d8c9cd4	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	0 / 0	16 minutes ago

The screenshot shows the 'mailpit' deployment page in the Kubernetes dashboard. It displays the status of the deployment as 'Progressing' and 'True'. Below this, a 'Nouveau Replica Set' is detailed with the following information:

Nom	Espace de nom	Âge	Pods
mailpit-6f94d7dc8f	default	50 seconds ago	2 / 2

Labels: k8s-app: mailpit, pod-template-hash: 6f94d7dc8f
Images: axllent/mailpit:latest

4. Créer un déploiement à l'aide de l'outil kubectl.

Suppression d'un déploiement :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get deployment
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
mailpit   2/2     2             2           21m
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl delete deployment mailpit
deployment.apps "mailpit" deleted from default namespace
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get deployment
No resources found in default namespace.
PS C:\WINDOWS\system32>
```

Création d'un déploiement

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl create deployment mailpit --image=axllent/mailpit
deployment.apps/mailpit created
PS C:\WINDOWS\system32>
```

Etat du déploiement

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get deployment
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
mailpit   1/1     1            1           24s
PS C:\WINDOWS\system32> kubectl get deployment -o wide
NAME      READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
mailpit   1/1     1            1           32s   mailpit      axllent/mailpit app=mailpit
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl describe deployment mailpit
Name:      mailpit
Namespace: default
CreationTimestamp: Wed, 06 May 2026 15:14:27 +0200
Labels:    app=mailpit
Annotations: deployment.kubernetes.io/revision: 1
Selector:  app=mailpit
Replicas:  1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType: RollingUpdate
MinReadySeconds: 0
RollingUpdateStrategy: 25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=mailpit
  Containers:
    mailpit:
      Image:      axllent/mailpit
      Port:       <none>
      Host Port:  <none>
      Environment: <none>
      Mounts:     <none>
      Volumes:    <none>
      Node-Selectors: <none>
      Tolerations: <none>
Conditions:
  Type           Status  Reason
  ----           -
  Available      True    MinimumReplicasAvailable
  Progressing    True    NewReplicaSetAvailable
OldReplicaSets: <none>
NewReplicaSet:  mailpit-7b96b48c5d (1/1 replicas created)
Events:
  Type           Reason             Age   From              Message
  ----           -
  Normal         ScalingReplicaSet  64s   deployment-controller  Scaled up replica set mailpit-7b96b48c5d from 0 to 1
PS C:\WINDOWS\system32>
```

Répliquas :

```

Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get replicaset
NAME                DESIRED   CURRENT   READY   AGE
mailpit-7b96b48c5d  1         1         1       116s
PS C:\WINDOWS\system32> kubectl describe rs mailpit-7b96b48c5d
Name:                mailpit-7b96b48c5d
Namespace:           default
Selector:            app=mailpit,pod-template-hash=7b96b48c5d
Labels:              app=mailpit
                    pod-template-hash=7b96b48c5d
Annotations:         deployment.kubernetes.io/desired-replicas: 1
                    deployment.kubernetes.io/max-replicas: 2
                    deployment.kubernetes.io/revision: 1
Controlled By:       Deployment/mailpit
Replicas:            1 current / 1 desired
Pods Status:        1 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:             app=mailpit
                    pod-template-hash=7b96b48c5d
  Containers:
   mailpit:
    Image:            axllent/mailpit
    Port:            <none>
    Host Port:       <none>
    Environment:     <none>
    Mounts:          <none>
  Volumes:           <none>
  Node-Selectors:    <none>
  Tolerations:       <none>
Events:
  Type    Reason          Age    From          Message
  ----    -
  Normal  SuccessfulCreate 2m25s  replicaset-controller  Created pod: mailpit-7b96b48c5d-wb5pm
PS C:\WINDOWS\system32>

```

Etat du pod

```

Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get pods
NAME                READY   STATUS    RESTARTS   AGE
mailpit-7b96b48c5d-wb5pm  1/1    Running   0          3m9s
PS C:\WINDOWS\system32> kubectl describe pods mailpit-7b96b48c5d-wb5pm
Name:                mailpit-7b96b48c5d-wb5pm
Namespace:           default
Priority:            0
Service Account:    default
Node:                minikube/172.25.34.187
Start Time:          Wed, 06 May 2026 15:14:27 +0200
Labels:              app=mailpit
                    pod-template-hash=7b96b48c5d
Annotations:         <none>
Status:              Running
IP:                  10.244.0.11
IPs:
  IP:                10.244.0.11
Controlled By:       ReplicaSet/mailpit-7b96b48c5d
Containers:
  mailpit:
   Container ID:     docker://61be2befb0f650d3701cc9b5b8ae8c5a96441e53f07da02b3ef4700ab0ccde20
   Image:            axllent/mailpit
   Image ID:         docker-pullable://axllent/mailpit@sha256:757f22b56c1da03570afdb3d259effe5091018008a81bbdc8158cee7
e16fdbc
   Port:            <none>
   Host Port:       <none>
   State:           Running
     Started:       Wed, 06 May 2026 15:14:29 +0200
     Ready:         True
     Restart Count: 0
     Environment:   <none>
   Mounts:
     /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-g7xg8 (ro)
Conditions:
  Type              Status
  PodReadyToStartContainers  True

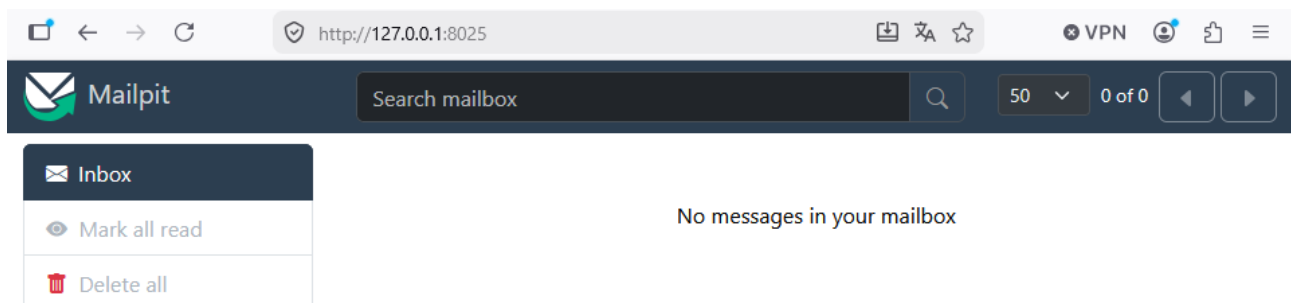
```

Accès aux logs du pod et des conteneurs

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl logs mailpit-7b96b48c5d-wb5pm
time="2026/05/06 13:14:29" level=info msg="[smtpd] starting on [::]:1025 (no encryption)"
time="2026/05/06 13:14:29" level=info msg="[cors] allowed API origins: "
time="2026/05/06 13:14:29" level=info msg="[http] starting on [::]:8025"
time="2026/05/06 13:14:29" level=info msg="[http] accessible via http://localhost:8025/"
PS C:\WINDOWS\system32> kubectl logs mailpit-7b96b48c5d-wb5pm -c mailpit
time="2026/05/06 13:14:29" level=info msg="[smtpd] starting on [::]:1025 (no encryption)"
time="2026/05/06 13:14:29" level=info msg="[cors] allowed API origins: "
time="2026/05/06 13:14:29" level=info msg="[http] starting on [::]:8025"
time="2026/05/06 13:14:29" level=info msg="[http] accessible via http://localhost:8025/"
PS C:\WINDOWS\system32>
```

Accès à l'application Mailpit

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl port-forward deployment/mailpit 8025
Forwarding from 127.0.0.1:8025 -> 8025
Forwarding from [::1]:8025 -> 8025
Handling connection for 8025
Handling connection for 8025
Handling connection for 8025
```



```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl expose deployment/mailpit --port 1025,8025
service/mailpit exposed
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl exec -it mailpit-7b96b48c5d-wb5pm -- sh
/ # getent hosts mailpit
10.109.45.94      mailpit.default.svc.cluster.local  mailpit.default.svc.cluster.local mailpit
/ #
```

Lancement d'un pod de test :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl run -it --rm pod-test --image=alpine sh
All commands and output from this session will be recorded in container logs, including credentials and sensitive information passed through the command prompt.
If you don't see a command prompt, try pressing enter.
/ # nslookup mailpit
Server:      10.96.0.10
Address:     10.96.0.10:53

** server can't find mailpit.cluster.local: NXDOMAIN

Name:   mailpit.default.svc.cluster.local
Address: 10.109.45.94

** server can't find mailpit.cluster.local: NXDOMAIN
** server can't find mailpit.svc.cluster.local: NXDOMAIN
** server can't find mailpit.svc.cluster.local: NXDOMAIN

/ # exit
Session ended, resume using 'kubectl attach pod-test -c pod-test -i -t' command when the pod is running
pod "pod-test" deleted from default namespace
PS C:\WINDOWS\system32>
```

Résilience et scalabilité (augmenter le niveau de résilience d'une application et augmenter la capacité de trafic d'une application pour répondre à des contraintes de charge)

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl scale deployment mailpit --replicas=2
deployment.apps/mailpit scaled
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get deployment mailpit
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
mailpit   2/2     2            2           14m
PS C:\WINDOWS\system32> kubectl get pods -l app=mailpit
NAME                                READY   STATUS    RESTARTS   AGE
mailpit-7b96b48c5d-wb5pm            1/1     Running   0          14m
mailpit-7b96b48c5d-xb6q2            1/1     Running   0          46s
PS C:\WINDOWS\system32>
```

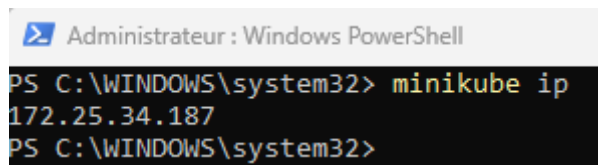
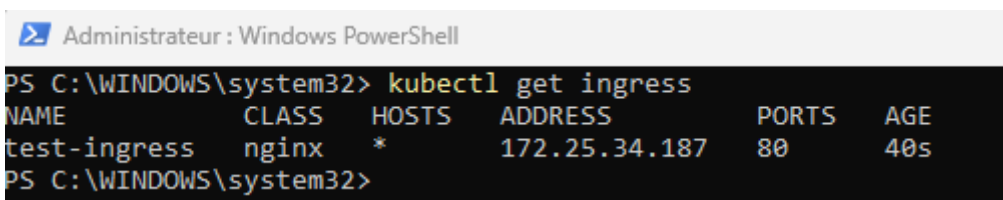
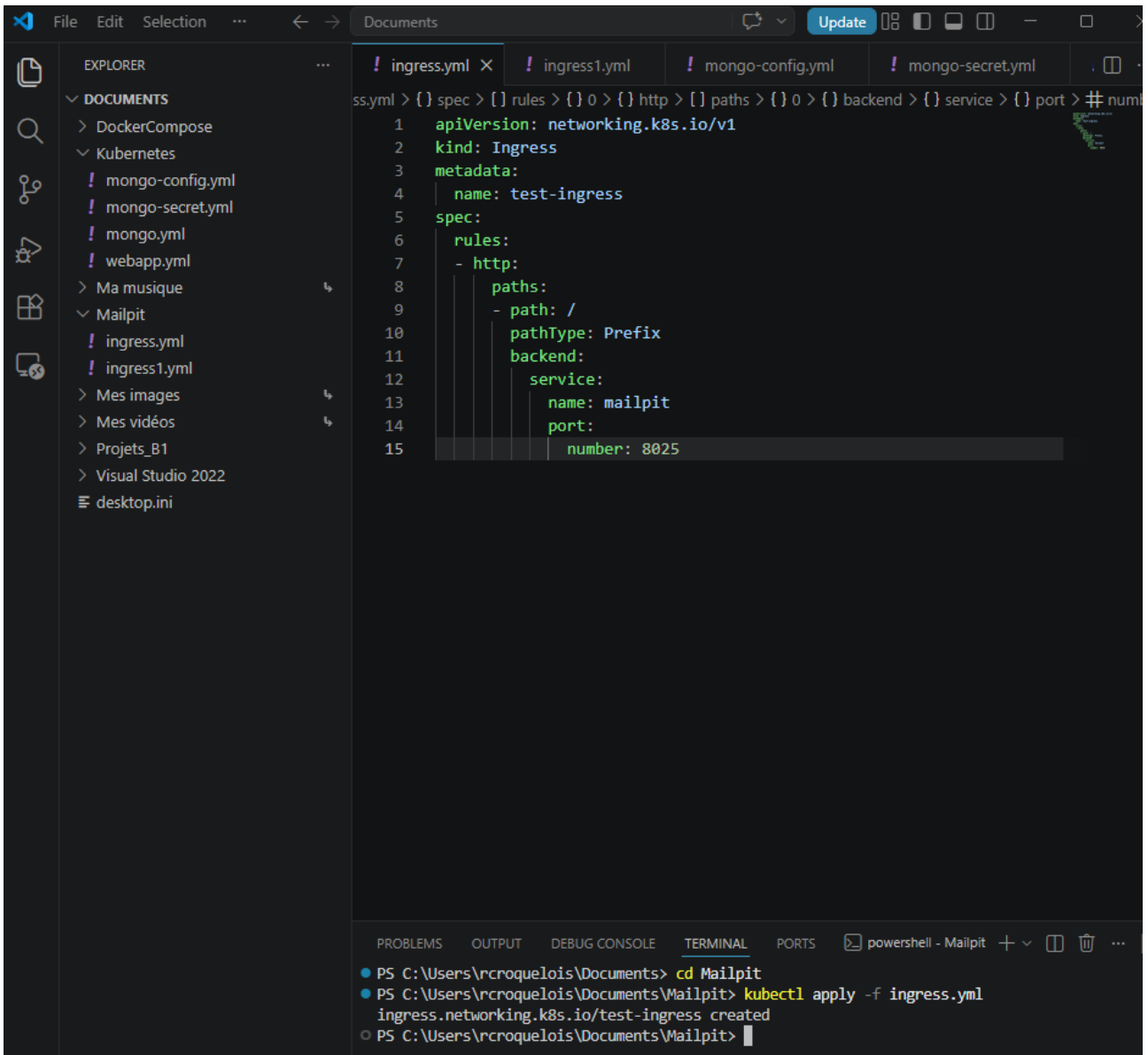
Activation du contrôleur Ingress dans Minikube :

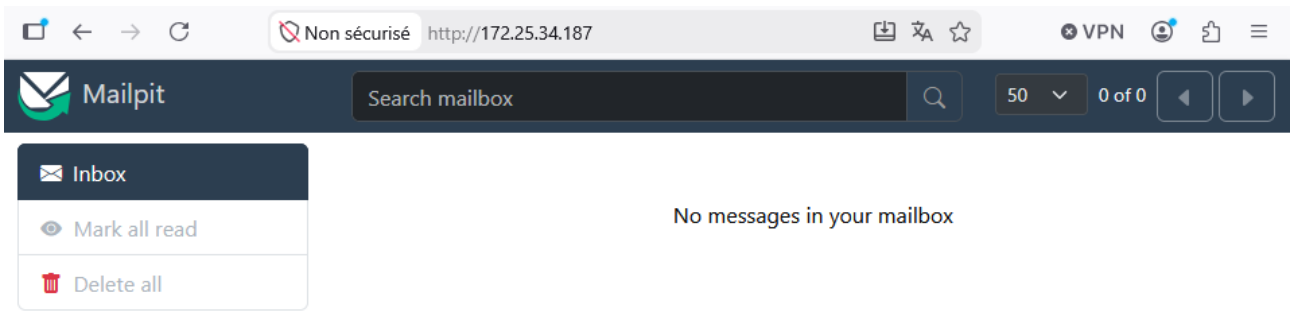
```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> minikube addons enable ingress
* ingress est un add-on maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
- Utilisation de l'image registry.k8s.io/ingress-nginx/controller:v1.14.3
- Utilisation de l'image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.6.7
- Utilisation de l'image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.6.7
* Vérification du module ingress...
* Le module 'ingress' est activé
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl get namespace
NAME                STATUS    AGE
default             Active   179m
ingress-nginx       Active   64s
kube-node-lease     Active   179m
kube-public         Active   179m
kube-system         Active   179m
kubernetes-dashboard Active   138m
PS C:\WINDOWS\system32>
```

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> kubectl -n ingress-nginx get pods -l app.kubernetes.io/name=ingress-nginx
NAME                                READY   STATUS    RESTARTS   AGE
ingress-nginx-admission-create-c68b8 0/1     Completed 0           108s
ingress-nginx-admission-patch-6691k   0/1     Completed 0           108s
ingress-nginx-controller-596f8778bc-5mg9s 1/1     Running   0           108s
PS C:\WINDOWS\system32>
```

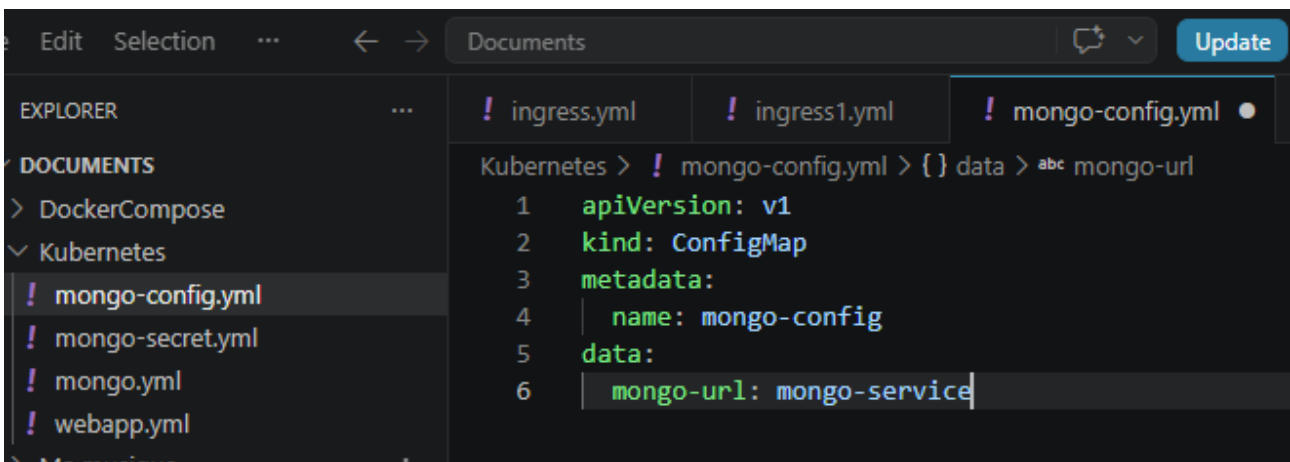
Déclaration d'une règle Ingress et prise en compte du fichier YAML :



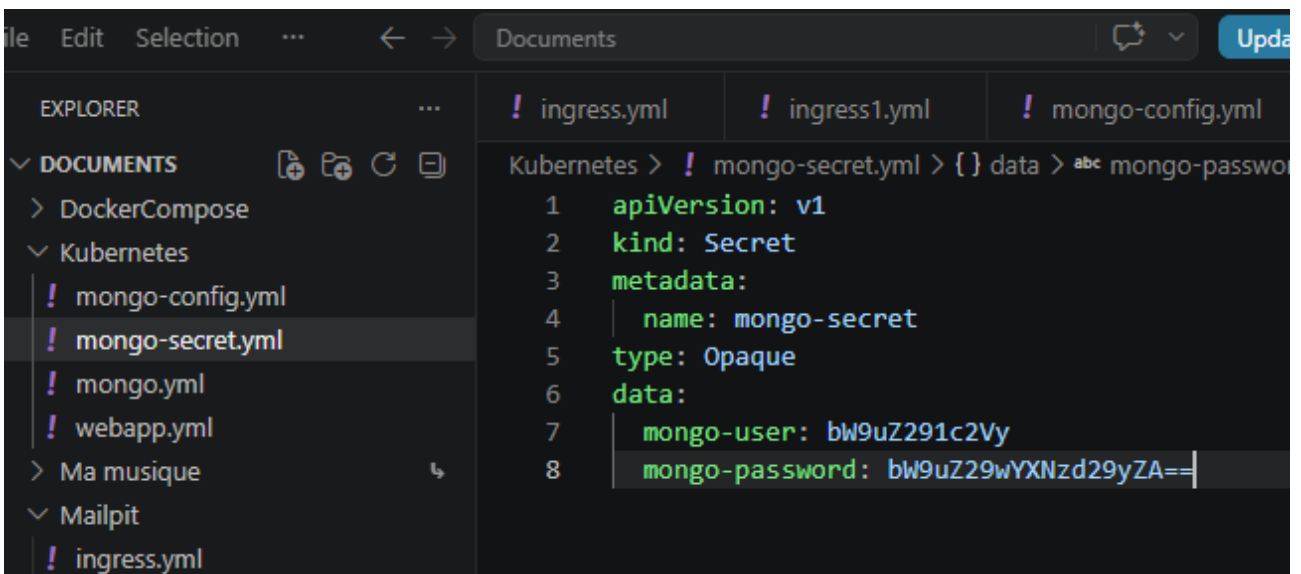


5. Automatisation de déploiement par fichier YAML.

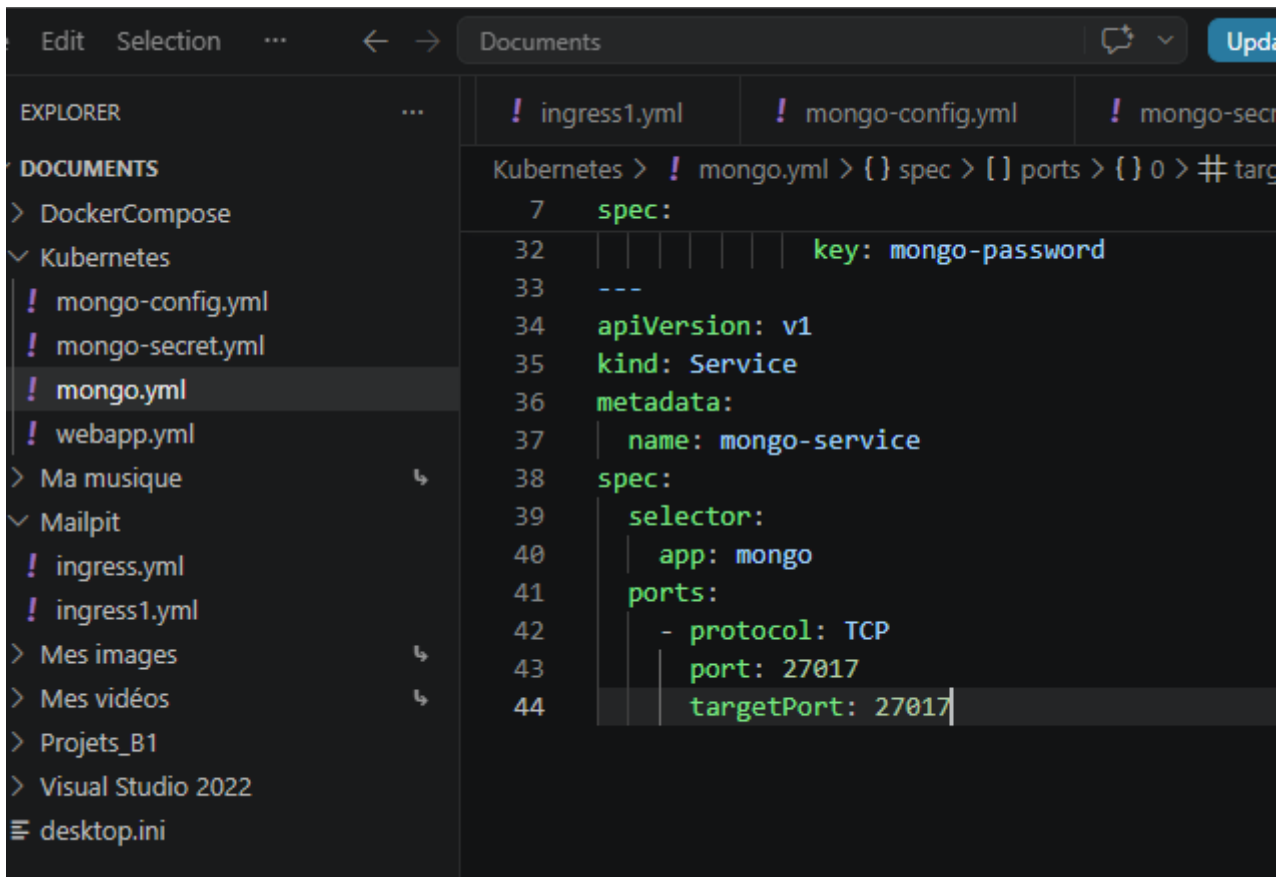
Composant de type ConfigMap :



Composant de type Secret :



Créer un service interne : service qui va permettre la communication entre le pod front et le pod de la base de données



The image shows a screenshot of the Visual Studio Code editor. On the left, the Explorer sidebar shows a project structure with folders like 'Kubernetes' and 'Mailpit', and files like 'mongo-config.yml', 'mongo-secret.yml', and 'mongo.yml'. The main editor area displays the content of 'mongo.yml', which is a Kubernetes Service manifest. The manifest is as follows:

```
7 spec:
32 | | | | | | key: mongo-password
33 ---
34 apiVersion: v1
35 kind: Service
36 metadata:
37 | name: mongo-service
38 spec:
39 | selector:
40 |   app: mongo
41 | ports:
42 |   - protocol: TCP
43 |     port: 27017
44 |     targetPort: 27017
```

Créer un service externe : pod du front accessible depuis l'extérieur du cluster Kubernetes

The image shows a screenshot of the Visual Studio Code editor. The Explorer sidebar on the left shows a project structure with folders like 'Ma musique', 'Mailpit', 'Mes images', 'Mes vidéos', 'Projets_B1', 'Visual Studio 2022', and 'desktop.ini'. Under the 'Kubernetes' folder, there are files: 'mongo-config.yml', 'mongo-secret.yml', 'mongo.yml', and 'webapp.yml'. The 'webapp.yml' file is selected and its content is displayed in the main editor. The code is a Kubernetes Service manifest for 'webapp' with a NodePort type. The 'nodePort' is set to 30100. The breadcrumb navigation at the top of the editor shows the path: 'Kubernetes > ! webapp.yml > {} spec > [] ports > {} 0 > # nodePort'. The code is as follows:

```
7 spec:
12   template:
37     | | | | | key: mongo-url
38     ---
39   apiVersion: v1
40   kind: Service
41   metadata:
42     name: webapp-service
43   spec:
44     type: NodePort
45     selector:
46       app: webapp
47     ports:
48       - protocol: TCP
49         port: 3000
50         targetPort: 3000
51         nodePort: 30100
```

Déployer l'application du pod front (webapp) : créer un composant de type deployment

The image shows a code editor with a dark theme. On the left is the Explorer sidebar showing a file tree with folders like 'Kubernetes' and 'Mailpit', and files like 'mongo-config.yml', 'mongo-secret.yml', 'mongo.yml', and 'webapp.yml'. The main editor area displays the content of 'webapp.yml' with line numbers 1 through 37. The manifest is a Kubernetes Deployment with the following structure:

```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: webapp-deployment
5    labels:
6      app: webapp
7  spec:
8    replicas: 1
9    selector:
10     matchLabels:
11       app: webapp
12   template:
13     metadata:
14       labels:
15         app: webapp
16     spec:
17       containers:
18         - name: webapp
19           image: nanajanashia/k8s-demo-app:v1.0
20           ports:
21             - containerPort: 3000
22           env:
23             - name: USER_NAME
24               valueFrom:
25                 secretKeyRef:
26                   name: mongo-secret
27                   key: mongo-user
28             - name: USER_PWD
29               valueFrom:
30                 secretKeyRef:
31                   name: mongo-secret
32                   key: mongo-password
33             - name: DB_URL
34               valueFrom:
35                 configMapKeyRef:
36                   name: mongo-config
37                   key: mongo-url
```

Déployer l'application mongo :

The image shows a code editor window with a dark theme. The Explorer sidebar on the left shows a file tree with folders like 'DOCUMENTS', 'Kubernetes', 'Ma musique', 'Mailpit', 'Mes images', 'Mes vidéos', 'Projets_B1', 'Visual Studio 2022', and 'desktop.ini'. Under 'Kubernetes', there are four files: 'mongo-config.yml', 'mongo-secret.yml', 'mongo.yml', and 'webapp.yml'. The main editor area shows the content of 'mongo.yml' with line numbers 1 through 32. The code is a Kubernetes Deployment manifest for MongoDB. The 'ports' section is expanded to show the 'targetPort' field. The 'spec' section includes 'replicas: 1', 'selector' with 'matchLabels' for 'app: mongo', and a 'template' with 'metadata' for 'app: mongo' and 'spec' for 'containers'. One container named 'mongodb' is defined with 'image: mongodb/mongodb-community-server:latest', 'ports' for 'containerPort: 27017', and 'env' for 'MONGO_INITDB_ROOT_USERNAME' and 'MONGO_INITDB_ROOT_PASSWORD', both using 'secretKeyRef' to reference 'mongo-secret'.

```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: mongo-deployment
5    labels:
6      app: mongo
7  spec:
8    replicas: 1
9    selector:
10     matchLabels:
11       app: mongo
12    template:
13     metadata:
14       labels:
15         app: mongo
16     spec:
17       containers:
18         - name: mongodb
19           image: mongodb/mongodb-community-server:latest
20           ports:
21             - containerPort: 27017
22           env:
23             - name: MONGO_INITDB_ROOT_USERNAME
24               valueFrom:
25                 secretKeyRef:
26                   name: mongo-secret
27                   key: mongo-user
28             - name: MONGO_INITDB_ROOT_PASSWORD
29               valueFrom:
30                 secretKeyRef:
31                   name: mongo-secret
32                   key: mongo-password
```

Procéder à la création des composants en appliquant la commande `kubectl apply -f` aux 4 fichiers YAML dans l'ordre figurant ci-dessous :


```
PROBLEMS OUTPUT TERMINAL ... powershell - Kubernetes + v
● PS C:\Users\rcoquelois\Documents\Kubernetes> kubectl get configmap
NAME          DATA  AGE
kube-root-ca.crt  1     14m
mongo-config    1     119s
● PS C:\Users\rcoquelois\Documents\Kubernetes> kubectl get secret
NAME          TYPE     DATA  AGE
mongo-secret  Opaque   2     117s
○ PS C:\Users\rcoquelois\Documents\Kubernetes> █
```

Décrire le service webapp-service :

```
PROBLEMS OUTPUT TERMINAL ... powershell - Kubernetes + v █ █ ... | █
● PS C:\Users\rcoquelois\Documents\Kubernetes> kubectl describe service webapp-service
Name:          webapp-service
Namespace:     default
Labels:        <none>
Annotations:   <none>
Selector:      app=webapp
Type:          NodePort
IP Family Policy: SingleStack
IP Families:   IPv4
IP:            10.103.99.10
IPs:           10.103.99.10
Port:          <unset> 3000/TCP
TargetPort:    3000/TCP
NodePort:      <unset> 30100/TCP
Endpoints:     10.244.0.16:3000
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:        <none>
○ PS C:\Users\rcoquelois\Documents\Kubernetes> █
```

Décrire le pod associé :

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
PS C:\Users\rCroqueLois\Documents\Kubernetes> kubectl describe pod webapp-deployment-5766fd95c7-56kj6
Name:          webapp-deployment-5766fd95c7-56kj6
Namespace:    default
Priority:      0
Service Account: default
Node:         minikube/172.27.123.18
Start Time:   Thu, 07 May 2026 12:37:27 +0200
Labels:       app=webapp
              pod-template-hash=5766fd95c7
Annotations:  <none>
Status:       Running
IP:           10.244.0.16
IPs:
  IP:         10.244.0.16
Controlled By: ReplicaSet/webapp-deployment-5766fd95c7
Containers:
  webapp:
    Container ID:  docker://4a8abeed0db15137d3f1c4d06743d4bd5fad6c9889001e09c1e1f3c032d160e9
    Image:         nanajanashia/k8s-demo-app:v1.0
    Image ID:     docker-pullable://nanajanashia/k8s-demo-app@sha256:6f554135da39ac00a1c2f43e44c2b0b54ca13d3d8044da969361e7781adb7f95
    Port:         3000/TCP
    Host Port:    0/TCP
    State:        Running
      Started:    Thu, 07 May 2026 12:38:09 +0200
    Ready:        True
    Restart Count: 0
    Environment:
      USER_NAME: <set to the key 'mongo-user' in secret 'mongo-secret'> Optional: false
      USER_PWD:  <set to the key 'mongo-password' in secret 'mongo-secret'> Optional: false
      DB_URL:     <set to the key 'mongo-url' of config map 'mongo-config'> Optional: false
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-l7sh8 (ro)
Conditions:
  Type                               Status
  PodReadyToStartContainers          True
  Initialized                         True
  Ready                              True
  ContainersReady                    True
  PodScheduled                       True

```

Consulter les logs de ce pod :

```

PROBLEMS  OUTPUT  TERMINAL  ...
kubectl - Kubernetes + v [ ] [ ] ... | [ ] [ ] X
● PS C:\Users\rCroqueLois\Documents\Kubernetes> kubectl get pod
NAME                                READY  STATUS             RESTARTS  AGE
mailpit-78f8f9dbbb-864mn            0/1   ImagePullBackOff  0          12m
mongo-deployment-744864fdd7-g7zzf   1/1   Running           0          6m36s
webapp-deployment-5766fd95c7-56kj6  1/1   Running           0          6m26s
● PS C:\Users\rCroqueLois\Documents\Kubernetes> kubectl logs webapp-deployment-5766fd95c7-56kj6
app listening on port 3000!
○ PS C:\Users\rCroqueLois\Documents\Kubernetes> kubectl logs webapp-deployment-5766fd95c7-56kj6 -f
app listening on port 3000!

```

Lister les services :

```

PROBLEMS  OUTPUT  TERMINAL  ...
powershell - Kubernetes + v [ ] [ ] ... |

PS C:\Users\racroque\Documents\Kubernetes> kubectl get service
NAME          TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
kubernetes    ClusterIP     10.96.0.1     <none>         443/TCP          21m
mongo-service ClusterIP     10.96.40.63   <none>         27017/TCP        8m50s
webapp-service NodePort      10.103.99.10  <none>         3000:30100/TCP  8m40s
PS C:\Users\racroque\Documents\Kubernetes>

```

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
PS C:\Users\racroque\Documents\Kubernetes> kubectl get node
NAME      STATUS  ROLES    AGE  VERSION
minikube  Ready   control-plane  22m  v1.35.1
PS C:\Users\racroque\Documents\Kubernetes> kubectl get node -o wide
NAME      STATUS  ROLES    AGE  VERSION  INTERNAL-IP  EXTERNAL-IP  OS-IMAGE          KERNEL-VERSION  CONTAINER-RUNTIME
minikube  Ready   control-plane  22m  v1.35.1  172.27.123.18 <none>       Buildroot 2025.02  6.6.95           docker://28.5.2
PS C:\Users\racroque\Documents\Kubernetes>

```

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
PS C:\Users\racroque\Documents\Kubernetes> kubectl get svc -o wide
NAME          TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE  SELECTOR
kubernetes    ClusterIP     10.96.0.1     <none>         443/TCP          24m  <none>
mongo-service ClusterIP     10.96.40.63   <none>         27017/TCP        11m  app=mongo
webapp-service NodePort      10.103.99.10  <none>         3000:30100/TCP  10m  app=webapp
PS C:\Users\racroque\Documents\Kubernetes> kubectl get pod -o wide
NAME          READY  STATUS    RESTARTS  AGE  IP           NODE      NOMINATED NODE  READINESS GATES
mailpit-78f8f9dbbb-864mn  0/1   ImagePullBackOff  0       17m  10.244.0.11  minikube <none>          <none>
mongo-deployment-744864fdd7-g7zzf  1/1   Running    0          11m  10.244.0.15  minikube <none>          <none>
webapp-deployment-5766fd95c7-56kj6  1/1   Running    0          10m  10.244.0.16  minikube <none>          <none>
PS C:\Users\racroque\Documents\Kubernetes>

```

User profile



Name: **Anna Smith**

Email: **anna.smith@example.com**

Interests: **coding**

Edit Profile

User profile



Name:

Email:

Interests:

User profile



Name: **Maximus le cinquième**

Email:

Interests: **DEVOPS**

Edit Profile